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Taxonomic Paper

The Giant Resin Bee, *Megachile sculpturalis* Smith: New Distributional Records for the Mid- and Gulf-south USA

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Abstract

Background

Megachile (*Callomegachile*) *sculpturalis* Smith, the giant resin bee, is an adventive species in the United States. First established in the United States during the early 1990s, records currently exist from most states east of the Mississippi River along with Iowa and Kansas.

New information

New distributional records are presented for *Megachile* (*Callomegachile*) *sculpturalis* Smith, an introduced bee. Additional records presented here expand the known distribution southwest through Arkansas, Louisiana, Mississippi, Missouri, and Texas. An updated host plant list containing new records is also presented, expanding the number of known floral associations.

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Keywords

Callomegachile, adventive, introduced, invasive species, distribution, range expansion, Giant Resin Bee, *Megachile sculpturalis*

Introduction

The giant resin bee, *Megachile* (*Callomegachile*) *sculpturalis* Smith, is a large, distinctive bee, adventive to the United States and Europe (Hinojosa-Díaz 2008, Quaranta et al. 2014). Originally found throughout the eastern Palearctic and Oriental regions including Japan, China, and other parts of eastern Asia, it was introduced into the United States and first collected from North Carolina in 1994 (Mangum and Brooks 1997). The range rapidly expanded across North America from the original location, reaching southwest to Alabama by 1999, north to Canada by 2002, northwest to Wisconsin by 2004, northeast to Maine by 2008, and westward to Kansas by 2008 (Hinojosa-Díaz 2008, Kondo et al. 2000, Mangum and Brooks 1997, Mangum and Sumner 2003, Mazurkiewicz 2010, Paiero and Buck 2003, Wolf and Ascher 2008).

The previously known distribution included most states east of the Mississippi River, with the exception of Mississippi (Mazurkiewicz 2010, Maier 2005, Tonietto and Ascher 2008). Niche modeling predicted that the western edge of range expansion will eventually stretch to western Texas, Oklahoma, Kansas, Nebraska, and South Dakota, areas of the western coast, along with sections of Mexico and the West Indies (Hinojosa-Díaz et al. 2005). This species has also been recently introduced into Europe and is currently established in France, Switzerland, and Italy (Quaranta et al. 2014, Amiet 2012, Vereecken and Barbier 2009, Gihr and Westrich 2013). *Megachile sculpturalis* is polylectic, but it has been speculated that they may preferentially pollinate plants that have been introduced into North America from its native range (Laport and Minckley 2012). Females prefer to nest in sites located in cavities (i.e. hollow stems or holes made by other insects) in shaded areas, and at least 0.5 m above the ground (Iwata 1933).

Characters to differentiate *M. sculpturalis* from native megachilids are presented in (Michener 2007), but it is currently the only species in the subgenus *Callomegachile* Michener widely established in the Nearctic region. Easily differentiated from native bees by a large, narrow, elongated body, female *M. sculpturalis* range in size from 22 – 27 mm, while males are considerably smaller at 14 – 19 mm with a distinctly wide yellowish “moustache” on their lower face; both sexes have prominently infuscated wings (Fig. 1) (Batra 1998). An additional species in the same subgenus as *M. sculpturalis*, *Megachile umbripennis* Smith, has been recently observed in southern Florida and New Jersey, but this bee is considerably smaller in size than *M. sculpturalis* (Ascher and Pickering 2015. Another relative of *M. sculpturalis*, *Megachile* (*Callomegachile*) *rufipennis* F., originally from Africa has become established in the Greater Antilles, but has not been observed in Nearctic areas (Genaro 1996, Pasteels 1965).

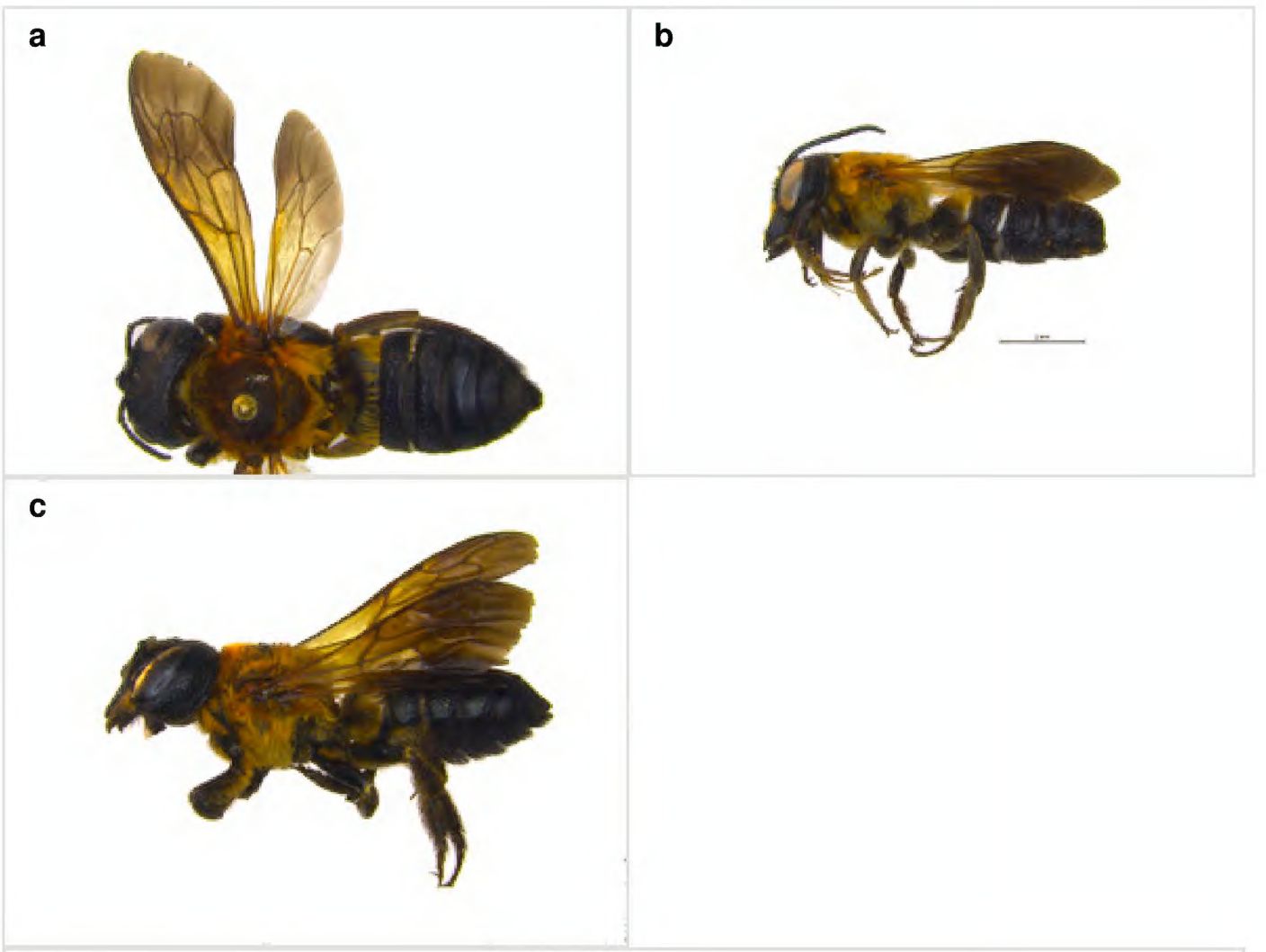

Figure 1.

Megachile sculpturalis. All images taken at the same scale.

a: dorsal view female.
b: lateral view male. Scale bar = 2mm.
c: lateral view female.

There are currently 19 species of introduced megachilid bees in the continental United States, including *M. sculpturalis* (Droge 2015). As introductions of non-native species have continued, evidence that some species pose threats to biodiversity and native ecosystems has increased (Simberloff et al. 2013). Noting the distribution, presence, and establishment of adventive species is important for documenting future impacts on native communities (Cane 2003). *Megachile sculpturalis* is a xylophilous (wood-loving) bee; however, females are incapable of boring their own cavities in wood. Instead, they are known to occupy abandoned nests of similarly sized bees, notably the nests of native carpenter bees, *Xylocopa virginica* (L.) (Batra 1998, Mangum and Brooks 1997). More recently, female *M. sculpturalis* have been observed aggressively evicting carpenter bee females from their nests (Laport and Minckley 2012, Roulston and Malfi 2012). Within their native range *M. sculpturalis* occupy nesting sites abandoned by a variety of other species (Iwata 1933).

Materials and methods

Collection data from adult specimens *of M. sculpturalis* taken in the mid- and gulf-south, in addition to specimens from Florida and Michigan, were gathered from both institutions and personal collections. Institutional collections used in the manuscript are listed below; acronyms, when available, follow Evenhuis (2015) and the global registry of biodiversity repositories (GRBio 2015). Personal collections from research studies include those of Mike Arduser (MA; surveys from Missouri), Zach Scott (ZS; survey data from Rhode Island), and the authors (designated by initials), and are designated as such.

UAAM - The Arthropod Museum, University of Arkansas, Department of Entomology, Fayetteville, AR

MEM - Mississippi Entomological Museum, Mississippi State University, Department of Biochemistry, Molecular Biology, Entomology, & Plant Pathology, Mississippi State, MS

SFAC - Stephen F. Austin State University, Department of Biology, Nacogdoches, TX

UMIC - University of Mississippi, Department of Biology, University, MS

BBSL - United States Department of Agriculture-Agricultural Research Service, Bee Biology and Systematics Laboratory, Logan, UT

Taxon treatment

Megachile (*Callomegachile*) *sculpturalis* Smith, 1853

Materials

a. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Arkansas; county: Benton; municipality: Gentry; locality: Chesney Prairie; decimalLatitude: 36.221636; decimalLongitude: -94.484357; year: 2012; month: 6; day: 20; verbatimEventDate: 20-6-2012; individualCount: 1; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; language: en; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

b. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Arkansas; county: Benton; municipality: Rogers; locality: Searles Prairie; decimalLatitude: 36.356395; decimalLongitude: -94.144186; year: 2012; month: 6; day: 20; verbatimEventDate: 20-6-2012; individualCount: 1; sex: male; lifeStage: adult;

preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; language: en; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

c. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Arkansas; county: Madison; municipality: Hindsville; decimalLatitude: 36.206389; decimalLongitude: -93.850278; samplingProtocol: Xylocopa virginica trap; year: 2012; month: 6; day: 19; verbatimEventDate: 19-6-2012; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; language: en; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

d. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Arkansas; county: Washinton; municipality: Fayetteville; locality: University of Arkansas; verbatimCoordinates: 36° 04’ 20.24 N, 94° 10’ 24.98 W; verbatimLatitude: 36° 04’ 20.24 N; verbatimLongitude: 94° 10’ 24.98 W; decimalLatitude: 36.072289; decimalLongitude: -94.173606; year: 2012; month: 6; day: 2; verbatimEventDate: 2.VI.2012; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: T. D. Edwards; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; language: en; institutionCode: UAAM; basisOfRecord: PreservedSpecimen

e. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Arkansas; county: Washinton; municipality: Fayetteville; locality: World Peace Wetland Prairie; decimalLatitude: 36.051894; decimalLongitude: -94.172728; year: 2011; month: 6; day: 29; verbatimEventDate: Jun-29-2011; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: UAAM; basisOfRecord: PreservedSpecimen

f. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Florida; county: Alachua; municipality: Gainesville; locality: University of Florida; verbatimCoordinates: 29.650428, -82.342365; verbatimLatitude: 29.650428; verbatimLongitude: -82.342365; decimalLatitude: 29.650428; decimalLongitude: -82.342365; year: 2013; month: 7; day: 8; verbatimEventDate: Jul-08-2013; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Clinton E. Trammel & Amber D. Tripodi; occurrenceStatus: present;

disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

g. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Florida; county: Alachua; municipality: Gainesville; locality: University of Florida; verbatimCoordinates: 29.650428, -82.342365; verbatimLatitude: 29.650428; verbatimLongitude: -82.342365; decimalLatitude: 29.650428; decimalLongitude: -82.342365; year: 2013; month: 7; day: 8; verbatimEventDate: Jul-08-2013; individualCount: 12; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Clinton E. Trammel & Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: ADT; basisOfRecord: PreservedSpecimen

h. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Florida; county: Alachua; municipality: Gainesville; locality: University of Florida; verbatimCoordinates: 29.650428, -82.342365; verbatimLatitude: 29.650428; verbatimLongitude: -82.342365; decimalLatitude: 29.650428; decimalLongitude: -82.342365; year: 2013; month: 6; day: 21; verbatimEventDate: Jun-21-2015; individualCount: 3; sex: 1 male, 2 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

i. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Florida; county: Alachua; municipality: Gainesville; locality: University of Florida; verbatimCoordinates: 29.650428, -82.342365; verbatimLatitude: 29.650428; verbatimLongitude: -82.342365; decimalLatitude: 29.650428; decimalLongitude: -82.342365; year: 2013; month: 6; day: 21; verbatimEventDate: Jun-21-2015; individualCount: 59; sex: 2 male, 57 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: ADT; basisOfRecord: PreservedSpecimen

j. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Louisiana; county: West Feliciana; municipality: St. Francisville; decimalLatitude: 30.792733; decimalLongitude: -91.249833; year: 2013; month: 7; day: 4; verbatimEventDate: Jul-04-2013; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus:

present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: ADT; basisOfRecord: PreservedSpecimen

k. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Michigan; county: Berrien; municipality: Watervlivet; verbatimCoordinates: 42.179430, -86.258730; verbatimLatitude: 42.179430; verbatimLongitude: -86.258730; decimalLatitude: 42.179430; decimalLongitude: -86.258730; year: 2015; month: 7; day: 31; verbatimEventDate: Jul-31-2015; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

l. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Michigan; county: Berrien; municipality: Watervlivet; verbatimCoordinates: 42.179430, -86.258730; verbatimLatitude: 42.179430; verbatimLongitude: -86.258730; decimalLatitude: 42.179430; decimalLongitude: -86.258730; year: 2015; month: 7; day: 31; verbatimEventDate: Jul-31-2015; individualCount: 11; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: ADT; basisOfRecord: PreservedSpecimen

m. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Grenada; municipality: Scobey; locality: Cascilla Road; locationRemarks: old wooden goat barn, nesting in holes made by Xylocopa; verbatimCoordinates: 33°53’34” N, -89°55’09” W; verbatimLatitude: 33°53’34” N; verbatimLongitude: -89°55’09” W; decimalLatitude: 33.892778; decimalLongitude: -89.919167; samplingProtocol: at large; year: 2015; month: 7; day: 4; verbatimEventDate: Jul-04-2015; individualCount: 3; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: M. L. Whitten; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

n. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Grenada; municipality: Scobey; locality: Cascilla Road; locationRemarks: old wooden goat barn, nesting in holes made by Xylocopa; verbatimCoordinates: 33°53’34” N, -89°55’09” W; verbatimLatitude: 33°53’34” N; verbatimLongitude: -89°55’09” W; decimalLatitude: 33.892778; decimalLongitude: -89.919167; samplingProtocol: at large; year: 2015; month: 7; day: 4; verbatimEventDate:

Jul-04-2015; individualCount: 3; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: M. L. Whitten; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

o. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Grenada; municipality: Scobey; locality: Cascilla Road; locationRemarks: old wooden goat barn, nesting in holes made by Xylocopa; verbatimCoordinates: 33°53'34" N, -89°55'09" W; verbatimLatitude: 33°53'34" N; verbatimLongitude: -89°55'09" W; decimalLatitude: 33.892778; decimalLongitude: -89.919167; samplingProtocol: at large; year: 2015; month: 7; day: 4; verbatimEventDate: Jul-04-2015; individualCount: 2; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: M. L. Whitten; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: KAP; basisOfRecord: PreservedSpecimen

p. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Lafayette; municipality: Oxford; year: 2005; month: 7; day: 25; verbatimEventDate: Jul-25-2005; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: UMIC; basisOfRecord: PreservedSpecimen

q. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Lafayette; municipality: Oxford; locality: University of Mississippi Campus; locationRemarks: taken from golden raintree, Koelreuteria paniculata; year: 2008; month: 4; day: 15; verbatimEventDate: Apr-15-2008; individualCount: 7; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Jonas King; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: UMIC; basisOfRecord: PreservedSpecimen

r. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Lafayette; municipality: Oxford; locality: University of Mississippi Campus; year: 2013; month: 7; day: 12; verbatimEventDate: Jul-12-2013; individualCount: 2; sex: 1 male, 1 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Clinton E. Trammel & Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

s. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Lafayette; municipality: Oxford; locality: University of Mississippi Campus; decimalLatitude: 34.365225; decimalLongitude: -89.534050; year: 2013; month: 7; day: 12; verbatimEventDate: Jul-12-2013; individualCount: 4; sex: 2 male, 2 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Clinton E. Trammel & Amber D. Tripodi; occurrenceStatus: present; disposition: in collection; identifiedBy: Amber D. Tripodi; type: PhysicalObject; institutionCode: ADT; basisOfRecord: PreservedSpecimen

t. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Tallahatchie; municipality: Paynes; locality: Shook Rd and Hwy 35; samplingProtocol: Bycatch in pheromone trap for moths; year: 2015; month: 5; day: 23; verbatimEventDate: May-23-2015; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: John Austin Coleman and Severino Signa; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

u. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Tallahatchie; municipality: Paynes; locationRemarks: old pig barn, nesting in holes made by Xylocopa; verbatimCoordinates: 33°55’29” N, -90°03’53” W; verbatimLatitude: 33°55’29” N; verbatimLongitude: -90°03’53” W; decimalLatitude: 33.924722; decimalLongitude: -90.064722; samplingProtocol: by net; year: 2015; month: 7; day: 6; verbatimEventDate: Jul-06-2015; individualCount: 2; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Katherine A. Parys and Nathan S. Little; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen

v. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Tallahatchie; municipality: Paynes; locationRemarks: old pig barn, nesting in holes made by Xylocopa; verbatimCoordinates: 33°55’29” N, -90°03’53” W; verbatimLatitude: 33°55’29” N; verbatimLongitude: -90°03’53” W; decimalLatitude: 33.924722; decimalLongitude: -90.064722; samplingProtocol: by net; year: 2015; month: 7; day: 6; verbatimEventDate: Jul-06-2015; individualCount: 2; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Katherine A. Parys and Nathan S. Little; occurrenceStatus: present; disposition: in collection; identifiedBy: Katherine A. Parys; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

w. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Oktibbeha; locality: 3 mi East of Starkville; locationRemarks: Collected in Vitex agnus-castus flowers; verbatimCoordinates: 33°25'47"N, -88°44'01" W; verbatimLatitude: 33°25'47"N; verbatimLongitude: -88°44'01" W; year: 2008; month: 7; day: 20; verbatimEventDate: Jul-20-2008; individualCount: 2; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: JoVonn G. Hill; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

x. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Oktibbeha; locality: 3 mi East of Starkville; locationRemarks: Collected in Vitex agnus-castus flowers; verbatimCoordinates: 33°25'47"N, -88°44'01" W; verbatimLatitude: 33°25'47"N; verbatimLongitude: -88°44'01" W; year: 2008; month: 7; day: 27; verbatimEventDate: Jul-27-2008; individualCount: 2; sex: 1 male, 1 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: JoVonn G. Hill; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

y. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Oktibbeha; locality: 3 mi East of Starkville; locationRemarks: Collected in Vitex agnus-castus flowers; verbatimCoordinates: 33°25'47"N, -88°44'01" W; verbatimLatitude: 33°25'47"N; verbatimLongitude: -88°44'01" W; year: 2008; month: 7; day: 29; verbatimEventDate: Jul-29-2008; individualCount: 5; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: JoVonn G. Hill; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

z. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Pear River; municipality: McNeill; locationRemarks: emerged from wooden trap nests, 3/8" holes; samplingProtocol: wooden trap nests, 3/8" holes; year: 2011; month: 7; day: 2-7; verbatimEventDate: VI-2-7-2011; individualCount: 3; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Christopher T. Werle; occurrenceStatus: present; disposition: in collection; identifiedBy: Blair J. Sampson; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

aa. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*;

subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Pear River; municipality: McNeill; locationRemarks: emerged from wooden trap nests, 3/8" holes; samplingProtocol: wooden trap nests, 3/8" holes; year: 2011; month: 7; day: 2-7; verbatimEventDate: VI-2-7-2011; individualCount: 4; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Christopher T. Werle; occurrenceStatus: present; disposition: in collection; identifiedBy: Blair J. Sampson; type: PhysicalObject; institutionCode: BJS; basisOfRecord: PreservedSpecimen

ab. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Yalobusha; locality: 4 mi NE of Coffeeville; locationRemarks: on back door of house; samplingProtocol: at large; year: 2004; month: 8; day: 6; verbatimEventDate: IIX-6-2004; individualCount: 2; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Ruth Tierce; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

ac. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: Barry; locationRemarks: cleared ridge top for cattle grazing, Flowering plants nearby: water hemlock, poke, mullein, blackberries, and Ozark chinquapin; verbatimCoordinates: N36°37'54.770" W93°49'05.382"; verbatimLatitude: N36°37'54.770"; verbatimLongitude: W93°49'05.382"; decimalLatitude: 36.631881; decimalLongitude: -93.818162; samplingProtocol: blue vane trap; year: 2015; verbatimEventDate: June 28- July 3, 2015; individualCount: 1; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: C. Zirkle; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: UAAM; basisOfRecord: PreservedSpecimen

ad. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: Barry; locationRemarks: cleared ridge top for cattle grazing, Flowering plants nearby: water hemlock and Ozark chinquapin; verbatimCoordinates: N36°37'38.993" W93°49'11.257"; verbatimLatitude: N36°37'38.993"; verbatimLongitude: W93°49'11.257"; decimalLatitude: 36.627498; decimalLongitude: -93.819794; samplingProtocol: blue vane trap; year: 2015; month: 6; verbatimEventDate: June 21 - 28, 2015; individualCount: 2; sex: 1 male, 1 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: C. Zirkle; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: UAAM; basisOfRecord: PreservedSpecimen

ae. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*;

subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: Lincoln; locality: Cuivre River State Park; year: 2006; month: 6; verbatimEventDate: Jun-2006; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Bruce Schutte; occurrenceStatus: present; disposition: in collection; identifiedBy: Mike Arduser; type: PhysicalObject; institutionCode: MA; basisOfRecord: PreservedSpecimen

af. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: Pettis; municipality: Drover's Prairie; locality: South of Sedalia about 10 miles; year: 2010; month: 7; day: 10; verbatimEventDate: Jul-10-2010; individualCount: 1; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Mike Arduser; occurrenceStatus: present; disposition: in collection; identifiedBy: Mike Arduser; type: PhysicalObject; institutionCode: MA; basisOfRecord: PreservedSpecimen

ag. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: St. Louis; municipality: St. Louis City; locality: City Museum; locationRemarks: emerged from old log house; year: 2004; month: 7; day: 5; verbatimEventDate: Jul-05-2004; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: George Diehl Jr. & Mike Arduser; occurrenceStatus: present; disposition: in collection; identifiedBy: Mike Arduser; type: PhysicalObject; institutionCode: MA; basisOfRecord: PreservedSpecimen

ah. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Missouri; county: St. Louis; municipality: St. Louis City; locality: St. Louis Zoo; year: 2007; month: 6; verbatimEventDate: Jun-2007; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Jane Stevens; occurrenceStatus: present; disposition: in collection; identifiedBy: Mike Arduser; type: PhysicalObject; institutionCode: MA; basisOfRecord: PreservedSpecimen

ai. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Rhode Island; county: Washington; municipality: Kingston; locality: University of Rhode Island East Farm; decimalLatitude: 31.620610; decimalLongitude: -94.647550; year: 2014; month: 7; day: 30; verbatimEventDate: Jul-30-2014; individualCount: 1; sex: male; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Zach Scott; occurrenceStatus: present; disposition: in collection; identifiedBy: Zach Scott; type: PhysicalObject; institutionCode: ZS; basisOfRecord: PreservedSpecimen

aj. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Tennessee; county: Henderson; municipality: Lexington; locationRemarks: taken in back yard; decimalLatitude: 35.681934; decimalLongitude: -88.365206; samplingProtocol: By Hand, In Yard; year: 2015; month: 6; day: 22; verbatimEventDate: Jun-22-2015; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: A. Hays; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: BBSL; basisOfRecord: PreservedSpecimen; informationWithheld: Street Address

ak. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Tennessee; county: Rutherford; locality: Stone's River Glade; locationRemarks: Collected on Rudbeckia sp. in cedar glade; verbatimCoordinates: 35°52'24" N 86°26'09" W; verbatimLatitude: 35°52'24" N; verbatimLongitude: 86°26'09" W; decimalLatitude: 35.873333; decimalLongitude: -86.435833; year: 2009; month: 7; day: 23; verbatimEventDate: VII-23-2009; individualCount: 1; sex: female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Beverly A. Smith; occurrenceStatus: present; disposition: in collection; type: PhysicalObject; institutionCode: MEM; basisOfRecord: PreservedSpecimen

al. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Texas; county: Nacogdoches; locality: Steven F. Austin State University Campus; verbatimElevation: 97 m; locationRemarks: on Vitex agnus-castus flowers (chaste tree); verbatimCoordinates: 31.62061°; - 94.64755°; verbatimLatitude: 31.62061°; verbatimLongitude: -94.64755°; decimalLatitude: 31.620610; decimalLongitude: -94.647550; individualCount: 2; sex: 1 male, 1 female; lifeStage: adult; preparations: whole animal (pinned); recordedBy: Dan Bennett; occurrenceStatus: present; disposition: in collection; identifiedBy: Dan Bennett; type: PhysicalObject; institutionCode: SFAC; basisOfRecord: PreservedSpecimen

am. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Noxubee; locality: Noxubee National Wildlife Refuge; individualCount: 1; lifeStage: adult; recordedBy: Richard Brown; occurrenceStatus: present; type: Event; basisOfRecord: HumanObservation

an. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith,

1853; continent: North America; country: United States; countryCode: US; stateProvince: Texas; county: Huntsville; locality: Sam Houston State University; year: 2014; month: 7; individualCount: 1; lifeStage: adult; recordedBy: John Pascarella; occurrenceStatus: present; type: Event; basisOfRecord: HumanObservation

ao. scientificName: *Megachile sculpturalis* Smith, 1853; taxonomicStatus: accepted; kingdom: Animalia; phylum: Arthropoda; class: Insecta; order: Hymenoptera; family: Megachilidae; vernacularName: Giant Resin Bee; nomenclaturalCode: ICZN; genus: *Megachile*; subgenus: *Callomegachile*; specificEpithet: sculpturalis; scientificNameAuthorship: Smith, 1853; continent: North America; country: United States; countryCode: US; stateProvince: Mississippi; county: Neshoba; municipality: Philadelphia; year: 2015; month: 7; individualCount: 1; lifeStage: adult; recordedBy: Jeff Harris; occurrenceStatus: present; type: Event; basisOfRecord: HumanObservation

Distribution

Specimen and observational data presented here expand the known distribution of *M. sculpturalis* to every state east of the Mississippi River and several western states including Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, and Texas (Fig. 2). Hinojosa-Díaz et al. (2005) used niche modeling to predict the expansion of the range in the United States, and current data continue to support that model (e.g., Hinojosa-Diaz 2008). While specimen records had previously been reported from Tennessee in the literature (Mangum and Sumner 2003), the records presented were in the far eastern portion of the state. Museum records now extend the distribution west within the state and include *Rudbeckia* sp. (Asteraceae/Compositae) as a new floral host from specimen data presented here. Record of *M. sculpturalis* from Rhode Island was anecdotally mentioned in Maier (2005) but never confirmed with collected specimens. The first record of *M. sculpturalis* west of the Mississippi River dates to 2004 (♀, St. Louis, MO) and is reported here for the first time. An examination of collections from Oklahoma did not yield any records in that state, in spite of records nearby in Arkansas, Missouri, and Texas. Records presented here and in other manuscripts show clear geographic expansion over time (Fig. 3), but it appears that the formal documentation of records lags behind the actual expansion.

Discussion

Introduced bees can have a variety of undesirable effects including competition with native bees for both nesting sites and floral resources, transmission of diseases to native species, changes in seed set of native plants, and pollination of introduced plants (Goulson 2003). Negative interactions have been observed between *M. sculpturalis* and the native *X. virginica*, though long-term effects of these aggressive behaviors on *Xylocopa* populations are unknown (Laport and Minckley 2012, Roulston and Malfi 2012). Nesting sites made by *X. virginica* were present at field locations where specimens were collected in both Paynes and Scobey, MS, and both species were observed simultaneously during the summer of 2015. Specimens of *M. sculpturalis* collected from Pearl River Co., MS emerged from 3 of 17 (18%) occupied wooden trap nests constructed of 3/8” holes while trying to collect

Osmia sp. It is highly likely that negative interactions exist with not only *Xylocopa*, but with *Osmia* and other cavity nesting species that would utilize a nest chamber of a similar diameter.

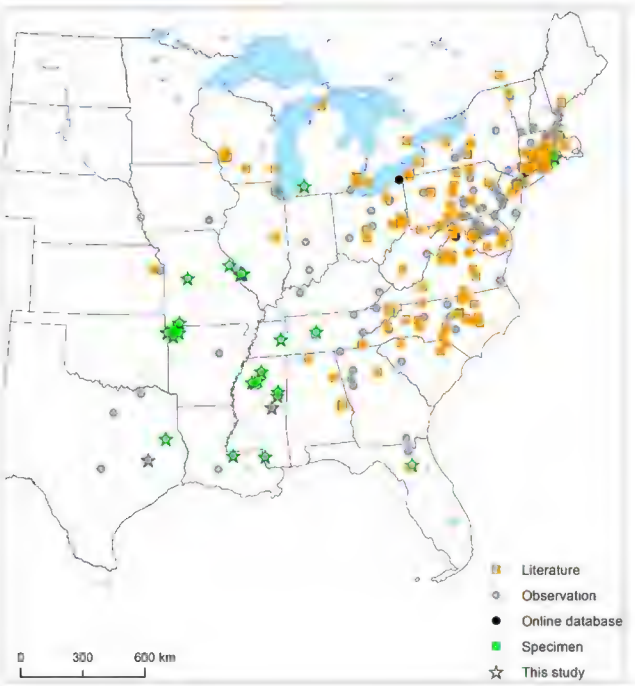

Figure 2.

Map of eastern US showing newly reported records collected from new (starred) specimen data presented here (green circles, observation records from personal communications, Bugguide and GBIF iNaturalist records (grey circles), the GBIF online specimen database (black circles) and in the literature (orange squares). See Suppl. material 1.

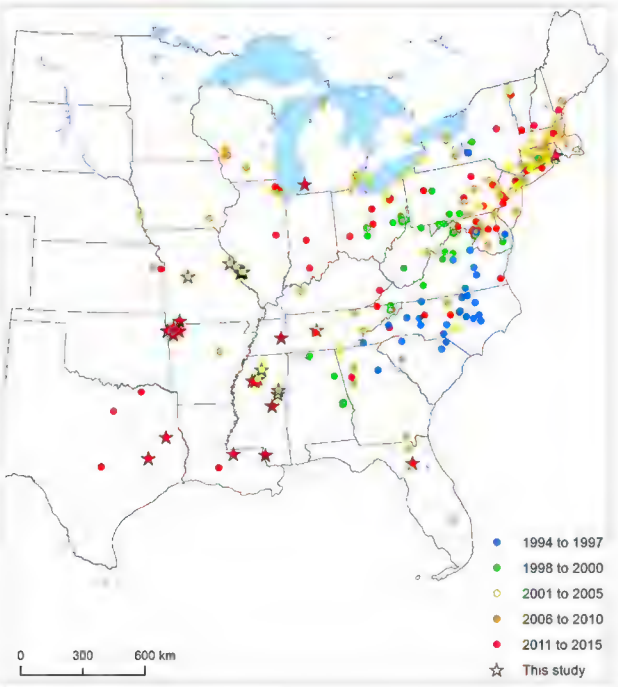

Figure 3.

Map of eastern US showing collection/observation dates for *M. sculpturalis*. Data compiled from new reports in this study (starred), as well as other sources. See Suppl. material 1.

Other non-native bee populations preferentially pollinate floral resources that have also been introduced (Hanley and Goulson 2003, Morales and Aizen 2002). Host plant records for *M. sculpturalis* indicate that the majority of published records have been collected from

plants not native to North America (Table 1). Current floral host plant associations include 43 species (30 species and an additional 13 genera without species names) in 21 families. While pollination is an important ecosystem service and provides an economic benefit to agricultural production, none of the plants listed in Table 1 are considered to be prominent crops in the mid-or gulf-south.

Table 1.

List of host plants associated with *M. sculpturalis*. Records are taken from scientific literature, photographs on Bugguide that included plant associations, and specimen data. Information concerning whether plants are native to North America and standardized plant names were found using The Plant List (2015) and references therein

Host Plant	**Status in North America**	**Data Location**
Apiaceae		
Daucus carota L.	Introduced	Bugguide (e.g. Wilder (2009))
Apocyanaceae		
Asclepias sp.	--	Mangum and Sumner (2003)
Asclepias syriaca L.	Native	Ascher (2001), Maier (2005)
Asteraceae/Compositae		
Cirsium vulgare (Savi) Ten.	Introduced	Ascher (2001)
Liatris sp.	--	Bugguide (e.g. Phillips (2014))
Liatris spicata (L.) Willd.	Native	Bugguide (e.g. Balaban and Balaban (2011))
Rudbeckia sp.	--	In specimen data above (MEM)
Solidago sp.	--	Maier (2005)
Bigonaniaceae		
Catalpa sp.	--	Norden (2008)
Catalpa speciosa (Warder) Engelm.	Native	Batra (1998), Mangum and Sumner (2003)
Boraginaceae		
Echium vulgare L.	Introduced	Bugguide (e.g. Harrison (2014))
Crassulaceae		
Sedum sp.	--	Bugguide (e.g. Moisset (2007))
Ericaceae		
Oxydendrum arboreum (L.) DC.	Native	Batra (1998), Mangum and Sumner (2003)
Fagaceae		
Castanea sp.	--	Quaranta et al. (2014)

Lamiaceae		
Lavandula sp.	--	Vereecken and Barbier (2009)
Origanum laevigatum Boiss.	Introduced	Bugguide (e.g. Roos (2013))
Perovskia artemisioides Boiss	Introduced	Ascher (2001)
Perovskia atriplicifolia Benth.	Introduced	Mazurkiewicz (2010)
Pycnanthemum sp.	--	Bugguide (e.g. Simpson and Simpson (2012))
Vitex sp.	--	Mangum and Sumner (2003)
Vitex agnus-castus L.	Introduced	Hall and Ascher (2010), In specimen data above (MEM)
Leguminosea		
Dunbaria villosa (Thunb.) Makino = *Dumbaria villosa*	Introduced	Batra 1998, Iwata 1933
Lathyrus latifolius L.	Introduced	Ascher (2001), Mangum and Sumner (2003), O'Brien and Craves (2008), Hinojosa-Díaz et al. (2005)
Lespedza sp.	--	Batra (1998)
Melilotus albus Medik.	Introduced	Ascher (2001), Paiero and Buck (2003)
Millettia japonica (Siebold &Zucc.) A. Gray	Introduced	Batra (1998), Iwata (1933)
Phaseolus vulgaris L.	Introduced	Batra (1998), Iwata (1933)
Pueraria lobata (Willd.) Ohwi.	Introduced	Mangum and Brooks (1997)
Pueraria montana var. lobata (Willd.) Sanjappa & Pradeep	Introduced	Iwata (1933)
Robinia sp.	--	Quaranta et al. (2014)
Securigera varia (L.) Lassen = *Coronilla varia* L.	Introduced	Ascher (2001)
Styphnolobium japonicum (L.) Schott = *Sophora japonica* L.	Introduced	Hinojosa-Díaz et al. (2005), Mangum and Sumner (2003), Matteson et al. (2008)
Vigna unguiculata (L.) Walp = *Vigna catiang* var. *sinensis* = *Vigna sinensis* (L.) Savi ex Hassk.	Introduced	Batra (1998), Iwata (1933)
Lythraceae		
Lagerstroemia indica L.	Introduced	Batra (1998)
Lythrum salicaria L.	Introduced	Mangum and Sumner (2003), Maier (2005), Maier (2009), O'Brien and Craves (2008)
Myrtaceae		
Eucalyptus sp.	--	Quaranta et al. (2014)
Oleaceae		
Chionanthus sp.	--	Norden (2008)

Ligustrum sp.	--	Norden (2008), Quaranta et al. (2014)
Ligustrum lucidum W.T. Aiton	Introduced	Mangum and Sumner (2003), Hinojosa-Díaz et al. (2005)
Ligustrum vulgare L.	Introduced	Batra (1998)
Plantaginaceae		
Veronicastrum virginicum (L.) Farw.	Native	Paiero and Buck (2003), O'Brien and Craves (2008)
Plumbaginaceae		
Limonium carolinianum (Walter) Britton	Native	Maier (2005)
Rosaceae		
Rubus sp.	--	Quaranta et al. (2014)
Rubiaceae		
Cephalanthus sp.	--	Bugguide (e.g. Borchelt (2015))
Rutaceae		
Citrus japonica Thunb. = *Fortunella margarita* Swingle	Introduced	Batra (1998)
Sapindaceae		
Koelreuteria paniculata Laxm.	Introduced	Mangum and Brooks (1997), Mangum and Sumner (2003), Hinojosa-Díaz et al. (2005), Batra (1998), In specimen data above (UMIC)
Scrophulariaceae		
Buddleja sp. = *Buddleia* sp.	--	Wolf and Ascher (2008)
Buddleja davidii Franch	Introduced	Mangum and Sumner (2003)
Verbascum thapsus L.	Introduced	Ascher (2001)
Vitaceae		
Parthenocissus sp.	--	Quaranta et al. (2014)

Specimens of *M. sculpturalis* were intercepted at the port of Baltimore in cargo shipped from Japan previous to establishment in 1968 and 1976 (Batra 1998). As cavity nesters that actively utilize holes made by other species, range expansion within the United States likely includes movement in wood. Distribution on wood in various forms is one of the most common methods by which invasive species are spread (Moore 2005). Additional locations with established populations of *X. virginica* were identified in Washington, Bolivar, and Sunflower Counties, MS and Chicot Co., AR but no *M. sculpturalis* were observed, suggesting that distributions are not continuous. The current known distribution of *M. sculpturalis* appears to be limited to locations where someone has noticed that these flying insects are not the commonly encountered *Xylocopa*. At several collection locations in MS, property owners were unaware of the presence of *M. sculpturalis* and allowed us to examine *Xylocopa* nesting locations, revealing new distributional points. This suggests that

especially in locations where multiple species occur, they are easily mistaken for *Xylocopa*. Of the records examined from the mid- and gulf-south, it appears that specimens are rarely collected by non-specialists.

Large distinctive bees that have been introduced to an area, like *M. sculpturalis* and others, can be monitored through online entomology and photography groups (e.g. Bugguide 2015) often before peer reviewed literature can be published. Eight of the new host plant records presented (Table 1) are from photographs posted on Bugguide, while traditional collection information specimen data provided only one new floral record.

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Supplementary material

Suppl. material 1: Supplementary table 1 - occurence data

Authors: K. A. Parys, A. D. Tripodi, B. J. Sampson
Data type: occurences
Brief description: spreadsheet containing occurence information for *M. sculpturalis* specimens.
Filename: Supp Table 1 Occurrence Map Data.xlsx - Download file (129.06 kb)